2.0 ENGINEERING DESCRIPTION OF THE SPRAY TANK PROCESS

The TOCDF is designed to operate as an integrated plant with all incinerators in concurrent operation. Different munitions and bulk item types require the operation of different combinations of incinerators. Liquid agent spray tanks are designated as TMU-28/B bulk containers. Spray tanks used for the MPF STDT will be from the DCD stockpile. The spray tanks will be punched and drained using the normal process for draining agent from the spray tanks. The LIC and DFS incinerators may be processing wastes during the STDT runs in an effort to supply the spray tanks for the next run. Descriptions of the waste handling and storage systems are provided only to facilitate an understanding of their configuration relative to the balance of the waste treatment system. More details on the waste handling and storage systems are provided in the TOCDF RCRA permit.

The incineration process includes a Primary Combustion Chamber (PCC) followed by an afterburner (AFB). Exhaust gases from the AFB are routed to the PAS, which includes a quench tower, a high-energy venturi scrubber, a low-energy packed bed scrubber, a demister, and an induced draft (ID) fan. Brief descriptions of the major discrete components follow. A detailed engineering description of the MPF is presented in the MPF VX ATB Plan (4).

2.1 WASTE HANDLING AND STORAGE

Chemical munitions processed at TOCDF are stored in DCD Area 10 until they are transported to the TOCDF for processing. Spray tanks are moved to the TOCDF Unpack Area (UPA) in the CNU-77/E23 shipping and storage container for spray tanks. The CNU-77/E23 shipping and storage container is a modified J-57 jet engine container consisting of a lower container assembly, which is mounted on wooden skids, and an upper container assembly. The outer shell and structure of the shipping containers are made of steel. The inner structure and support assembly is made of aluminum and steel.

The DCD personnel monitor the shipping and storage containers for agent and conduct a vapor tightness test before moving the containers from Area 10. Containers with an agent reading of < 0.2 Time Weighted Average (TWA) are considered agent free and are delivered to the Container Handling Building (CHB) where they are stored until ready for processing. Containers are taken to the UPA where the shipping container is monitored for Agent VX. If agent readings are < 0.2 TWA the shipping container is opened and the spray tank removed and placed into a processing cradle. The shipping container will then be loaded into a F999 waste roll off container outside the Munitions Demilitarization Building (MDB). Shipping containers will then be sent to an off-site Treatment, Storage, or Disposal Facility (TSDF). Containers with agent readings in Area 10 that are greater than (>) 5 TWA are taken to the Toxic Maintenance Area (TMA) and unloaded similar to a leaking ton container. The spray tank will

be removed from the shipping container and placed in a cradle. The spray tank is then transferred to the Munitions Processing Bay for normal processing. The shipping container is decontaminated and then air washed for a period of time. The shipping container is monitored again for Agent VX. If the ACAMS readings are < 0.2 TWA, the shipping containers are placed in a roll off designated for F999 waste. If the shipping container has ACAMS readings > 0.2 TWA, the shipping container will be decontaminated and monitored or disassembled into smaller pieces and processed through the MPF as contaminated metal wastes. The disassembled shipping container is removed from the MPF, cooled, and placed in a roll off container designated for F999 waste. The shipping containers will then be sent to an off-site TSDF.

Shipping containers with ACAMS readings in Area 10 between 0.2 and 5 TWA will be taken to the CHB Door 141 at the south end of the CHB transition corridor. The shipping container with the spray tank will be loaded onto an ONC tray and immediately transferred to the UPA. This operation minimizes contamination of the CHB. The spray tank will be removed and placed in the processing cradle and taken directly to the Munitions Processing Bay (MPB). The shipping container is monitored again. If the ACAMS readings are < 0.2 TWA, the shipping containers are placed in a roll off designated for F999 waste. If the shipping container has ACAMS readings > 0.2 TWA, the shipping container will be decontaminated and monitored or disassembled into smaller pieces and processed through the MPF as contaminated metal wastes. The disassembled shipping container is removed from the MPF, cooled and placed in a roll off container designated for F999 waste. The shipping containers will then be sent to an off-site TSDF.

Agent removed from the spray tanks is pumped to the Agent Collection System (ACS) tanks. The two ACS tanks are vertical, carbon steel tanks constructed to American Society of Mechanical Engineers (ASME), Section VIII standards. The ACS-TANK-101 has a working volume of 500 gallons, while ACS-TANK-102 has a working volume of 1300 gallons. Agent remaining in the spray tanks is destroyed in the MPF. Residues remaining in the treated spray tanks are removed and managed as a separate waste stream from the spray tanks. The nose cone is removed from the spray tank and the lead is managed as a separate waste stream. Treatment residues generated from MPF operation will be handled as directed by the Waste Analysis Plan.

The facility also generates spent decontamination solution (Decon) during the demilitarization processes. Decon is captured in MDB sumps and pumped to one of three Spent Decontamination System (SDS) tanks for processing in a LIC secondary combustion chamber (SCC). The SDS tanks are 2300-gallon vertical, lined carbon steel tanks, constructed to ASME, Section VIII, Division 1 standards. Each tank is sampled and analyzed for Agent VX after it has been filled. If Decon meets the treatment criteria, it is pumped through a spray nozzle in the top of the LIC SCC. Acid gases generated during combustion are removed from the exhaust gas by the PAS. The Brine removes the acid gases and neutralizes the acidic compounds. Brine is stored in tanks until it is shipped off-site for disposal.

2.2 BULK DRAIN AND DRILL STATIONS

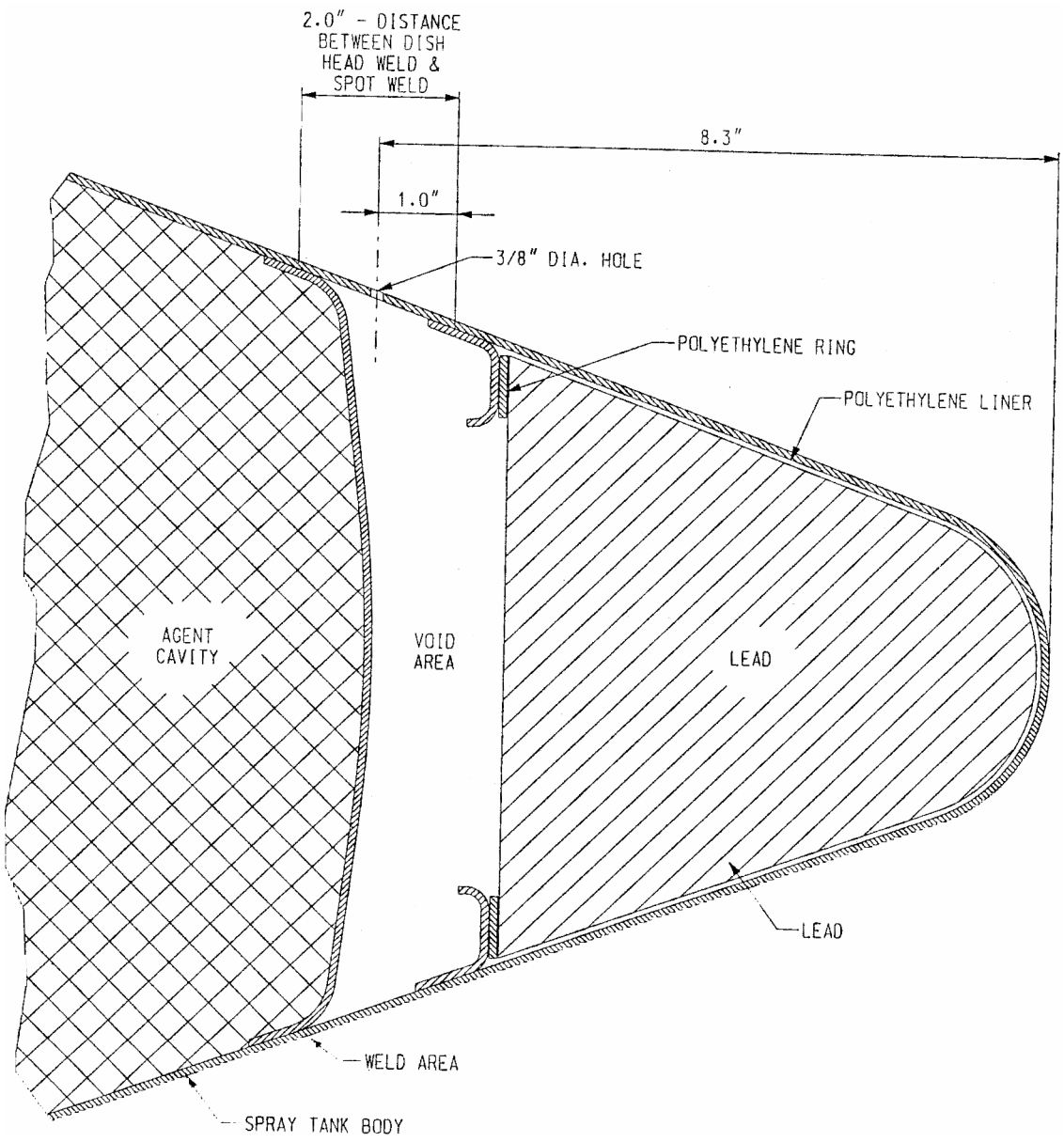
Each spray tank is approximately 136 inches in length and 22.5 inches in diameter. Paint on the exterior of the spray tanks will add 1.6 pounds of lead per spray tank. Spray tanks are equipped with a sealed compartment at the tip of each spray tank (nose cone). The nose cone contains 81 lbs. of lead, a polyethylene covering on the lead, a 1 inch by 0.050 inch thick polyethylene ring gasket and a stainless steel retaining ring insert. The insert is spot welded to the outer skin to retain the lead in a tight fit within the nose cone.

The UPA operator will use a template that fits around the nose cone of the spray tank to mark a drill location between the continuous weld where the nose cone meets the agent cavity and the tack welds that secure the lead retaining ring inside the nose cone. The mark will be used by the demil operator to ensure that the spray tank is properly located so the drill will enter the nose cone in the void space between the lead and the agent cavity. The angle of the drill ensures the drill enters the void space and not the agent cavity.

Spray tanks are placed inside a specifically designed cradle for processing spray tanks through the MDB. The cradle and spray tanks are placed on a flat tray. The trays are moved through the MDB to the Bulk Drain Station (BDS) by a series of electric and hydraulic driven conveyors. Spray tanks are punched at the BDS with a hydraulic punch. The punches are located at 48 inches from the nose and 16 inches from the end of the spray tank. The punch extends downward piercing the 0.080 inch thick 304 stainless steel skin of the spray tank making a hole in the agent cavity. The tray is then moved forward to the next position where the drain probe extends down inside the spray tank draining the agent. Each spray tank is filled with approximately 160 gallons of Agent VX.

The tray is indexed forward to the next sensor after the agent is drained and the vent hole is drilled in the nose cone. The drill fixture extends and drills a 3/8-inch vent hole in the nose cone of the spray tank to prevent any potential pressurization at MPF operating temperatures. Figure 2-1 shows a cross sectional view of the nose cone. The hole is drilled approximately 8 inches from the tip of the spray tank making the hole in the top of the void area in the nose cone. The control room operator will monitor from a closed circuit television camera to ensure the drilled hole is in the proper location in relation to the mark placed on the spray tank by the UPA operator. The demil operator may take manual control of the equipment to stop the drill operation and restage if necessary. Experience obtained during shakedown will further define the drilling operation. Proper drill location will be documented by the control room operator and the supervisor will sign off verifying the hole has been properly drilled.

FIGURE 2-1. NOSE CONE DIAGRAM.



Two additional holes are punched in the agent cavity of the spray tank. These holes in the agent cavity allow for better air circulation inside the agent cavity ensuring complete combustion of the residual agent. The tray is then moved down to the lower buffer storage area where the tray waits to be processed through the MPF.

2.3 COMBUSTION PROCESS

The MPF was custom-designed by Wellman Furnaces, Inc., and given model designation S.O. 89-305. The PCC is 41 feet long and 6.6 feet high (internal dimensions). It is a refractory-lined chamber containing a roller hearth. The PCC is equipped with 10 burners that are rated for a maximum total heat rate of 15.7 million British thermal units per hour (Btu/hr). Natural gas mixed with combustion air provides the fuel for the 10 burner nozzles in the PCC. The fuel mixture is burned to maintain the PCC between 1,200°F and 1,800°F. An ID fan draws the combustion gases from the PCC through the refractory-lined crossover duct to the AFB.

Combustion gases are discharged from the PCC through the refractory-lined crossover duct into the AFB. The AFB provides high temperature, residence time, and turbulent mixing to complete the thermal destruction of any Agent VX remaining in the PCC effluent. Wellman also designed the AFB (Drawing TE-1-F-503). It is a horizontal, steel cylindrical shell lined with 4 inches of K-30 insulating firebrick and mounted directly over the PCC. It is 38 feet long and 4 feet in diameter (inside dimensions). The cross-sectional area of the AFB is 12.6 ft^2, and its total volume is 477 ft^3. The two fuel gas burners used in the AFB are rated at 8.5 million Btu/hr. The AFB maintains gas temperatures between 1,800°F and 2,175°F for a minimum of 0.5-second residence time to ensure complete combustion of organic compounds. Excess air is supplied to ensure complete combustion of residual organic compounds in the AFB.

Exhaust gases from the AFB are monitored for O_2 by a high-speed O_2 analyzer to ensure the O_2 concentrations is greater than 8%. If the O_2 concentration drops below 8%, control valves add combustion air through a duct on two sides of the AFB. The airflow continues in 5-minute increments until 8% O_2 is achieved. Dilution air is also activated if the AFB temperature reaches 2,050°F to assist in combustion and aid in AFB cooling.

2.4 POLLUTION ABATEMENT SYSTEM

The PAS is designed to remove acid gases, particulate matter, and metals from the exhaust gases prior to discharge to the atmosphere. The PAS consists of a quench tower, high-energy venturi scrubber, packed bed scrubber, demister, ID fan, and an emergency blower. Exhaust gases are cooled to their adiabatic saturation temperature in the quench tower by alkaline water sprays. The quench tower is an upflow design with a diameter of 6 feet and a height of 40 feet. Normal operating conditions use a liquid to gas ratio of 100 gallons per minute (gpm) to about 24,600 actual cubic feet per minute (acfm). The quench tower was designed for a maximum inlet

temperature of 2,150°F and a maximum outlet temperature of 225°F. Typical gas inlet and exit temperatures will be less than 1,950°F and 200°F, respectively.

Exhaust gases pass from the quench tower through the high-energy venturi scrubber where high-pressure brine sprays create small droplets for efficient particulate capture. Acid gases are absorbed by the Brine and neutralized by the caustic in the Brine. The venturi will operate with a pressure differential in the range of 20 to 40 inches of water column (in.wc) when the system is processing agent. The exit from the venturi scrubber leads to a 90° vertical to horizontal elbow in the ductwork. The high velocity of the exhaust gases combined with the change of direction in flow removes the particulate matter from the gases.

The scrubber tower is a Hastelloy vessel 5 feet 6 inches in diameter and 40 feet high. Effluent from the venturi scrubber enters the scrubber tower where the liquid falls to the tower reservoir and the gases rise through the chimneys of the clean liquor tray. The clean liquor is controlled to a pH greater than 7 by the addition of 18% sodium hydroxide (NaOH). Exhaust gases are scrubbed by the clean liquor, which removes particulate matter and neutralizes any remaining acid gases. Finally, the gases pass through a mist eliminator as they exit the scrubber tower.

Exhaust gases travel from the scrubber tower to the demister. The demister is a fiberglass vessel 11 feet in diameter and 31 feet high. Gases flow through the demister candles which remove entrained solids and liquid droplets. Solids are trapped on the candles. Liquids drain to the vessel bottom where they are pumped to the scrubber reservoir.

An ID fan maintains the MPF and associated PAS under a negative pressure to prevent fugitive emissions. The ID fan is a two-stage blower. The PCC is typically maintained at greater than 0.5 in.wc vacuum relative to the MPF furnace room.

The scrubber tower reservoir receives all Brine drainage from PAS components. Brine density controls the discharge of Brine from the reservoir. Brine is discharged to holding tanks when the specific gravity reaches 1.18. Process water is introduced to maintain the liquid volume in the reservoir. Brine is pumped to one of four waste holding tanks for storage prior to off-site disposal. The pH of the Brine is controlled above 7.0. The Brine total dissolved solids are typically about 100,000 ppm and the total suspended solids are typically about 800 ppm.